

REMARKS

Claims 1-21 were pending in the subject application, with claims 11-20 having been withdrawn by the Patent Office from consideration. By this Amendment, claim 5 and withdrawn claims 11-20 have been canceled, without disclaimer or prejudice to applicant's right to pursue the claims in one or more divisional or continuation applications, claims 1, 2, 4 and 8 have been amended to correct informalities therein and/or clarify the claimed subject matter, and new claim 22 has been added. Accordingly, claims 1-10, 21 and 22 are now pending, with claims 1 and 22 being in independent form.

Rejection under 35 U.S.C. §112, second paragraph

In Section 4 of the September 18, 2006 Office Action, claims 1-10 and 21 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner stated that in claim 1, it is unclear what the three-dimensional crosslinked structure consists of because only a non-crosslinked polymer comprises (a) an ethylene unit and/or propylene unit and (b) an unsaturated carboxylic acid unit. The Examiner stated that it is unclear what the third crosslinked structure refers to.

The Examiner stated that in claim 2, there is no antecedent basis for "by weight of the crosslinked polymer matrix". The Examiner further stated that there is no crosslinked polymer matrix cited in claim 1. The Examiner also stated that claim 2 is vague and indefinite and does not further limit claim 1 from which it depends.

The Examiner stated that claim 4 is rejected because it is unclear what the first and second copolymerizable monomer units are because the claim refers to "a third copolymerizable monomer". The Examiner further stated that there is no antecedent basis and the claim does not further limit claim 1 from which the claim depends.

The Examiner stated that claim 5 is rejected because it is unclear how this claim further limits claim 1 from which the claim depends because claim 1 already cites that the non-crosslinked polymer is made from a polyalkylene glycol compound having one terminal hydroxyl group protected and a polymer containing an ethylene unit and/or propylene unit and unsaturated carboxylic acid unit.

The Examiner stated that claim 8 is rejected because there is no antecedent basis for "wherein the crosslinked polymer matrix".

In response, without conceding the correctness of the Examiner's position but solely to advance the prosecution of the subject application, Applicant has, by this Amendment, amended claims 1, 2, 4 and 8 to correct informalities therein and/or clarify the claimed subject matter.

Applicant respectfully submits that the claims as amended clearly recite the subject matter Applicant regards to be the invention. Accordingly, withdrawal of the rejection of claims 1-10 and 21 under 35 U.S.C. § 112, second paragraph, respectfully requested.

Rejection Under 35 U.S.C. § 102(b)

In Section 6 of the September 18, 2006 Office Action, claims 1, 3-5, 7-10 and 21 were rejected under 35 U.S.C. § 102(b) as purportedly anticipated by U.S. Patent No. 5,270,137 to Kubota.

The Examiner stated that Kubota teaches in columns 3-4, a separator comprising monomers represented by Formula (1), Formula (2) and Formula (3) compounds. The Examiner further stated that Kubota teaches in column 5, lines 60-64, that in conducting polymerization that any one of the compounds of general formula (1), (2) and (3) may be polymerized alone, or two or more of these compounds may be polymerized in combination with one another in an arbitrary proportion. The Examiner also stated that Kubota teaches in column 9, lines 23-25, that 1-mol/l of LiBF₄ was used in a solution of propylene carbonate/dimethoxyethane.

Applicant maintains that the subject matter recited in claim 1 cannot be anticipated by Kubota because Kubota fails to disclose each and every element of the claimed invention.

The present application relates to a polymer gel electrolyte composition having a high ion conductivity, excellent thermostability and transparency. For example, a polymer gel electrolyte composition as defined by amended claim 1 comprises (i) a crosslinked polymer network matrix and (ii) a non-crosslinked polymer included in the crosslinked polymer network matrix. The crosslinked polymer network gel matrix has a three-dimensional crosslinked structure and contains a solution of an electrolyte in a non-aqueous solvent. The non-crosslinked polymer is obtained by reacting a polyalkylene glycol compound having one terminal hydroxyl group protected, with a precursor polymer containing an ethylene unit and/or propylene unit and an unsaturated carboxylic acid unit.

The present application, for example, at page 4, lines 13-22 and page 19, line 23 to page 20, line 3, describes such a polymer gel electrolyte composition which has a gel structure that is a semi-interpenetrating polymer network type gel, a so-called semi-IPN-type gel, in which the non-crosslinked polymer is entangled in

the crosslinked polymer network gel matrix. The three-dimensional structure is constructed from crosslinkable monomers, such as those recited in claim 8. The non-crosslinked polymer does not chemically bond with the crosslinked polymer network gel matrix.

As described in the present application, for example, at page 17, lines 10-17, the polymer gel electrolyte composition of such a construction can be produced by adding the crosslinkable monomer to a solution of the electrolyte in the non-aqueous solvent, in which the non-crosslinked polymer has been dissolved, and subjecting the mixture to a reaction condition under which the crosslinkable monomer is crosslinkingly polymerized. The non-crosslinked polymer does not react in the crosslinking polymerization. As a result, the crosslinkable monomer forms a three-dimensionally crosslinked gel structure in which the electrolyte solution is contained, and the non-crosslinked polymer molecules penetrate the gel lattices of the gel structure.

Kubota, as understood by Applicant, proposes a secondary battery with graft-polymerized separator wherein the separator is prepared by plasma-treating a porous polymer substrate and polymerizing a monomer in the presence of the plasma-treated substrate. The monomer is graft-polymerized onto the substrate.

The separator prepared in the manner proposed by Kubota is substantially different from the polymer gel electrolyte composition recited in amended claim 1 of the present application. In the approach proposed by Kubota, the graft polymer produced from the monomer chemically bonds with the substrate.

Kubota simply does not teach or suggest, however, a polymer gel

electrolyte composition comprising (1) a crosslinked polymer network matrix and (2) a non-crosslinked polymer included in the crosslinked polymer network matrix, wherein the crosslinked polymer network gel matrix has a three-dimensional crosslinked structure and contains a solution of an electrolyte in a non-aqueous solvent, and the non-crosslinked polymer is obtained by reacting a polyalkylene glycol compound having one terminal hydroxyl group protected, with a precursor polymer containing an ethylene unit and/or propylene unit and an unsaturated carboxylic acid unit, as provided by the subject matter of amended claim 1 of the present application. Similarly, Kubota fails to teach or suggest the subject matter of new claim 22 of the present application.

Regarding claims 3, 4, 7-10 and 21, Applicant respectfully points out that claims 3, 4, 7-10 and 21 depend on and include all the limitations of claim 1. Thus, claims 3, 4, 7-10 and 21 are patentable at least for the reasons set forth above with respect to claim 1.

Since claim 5 has been canceled hereinabove, the rejection with regard to claim 5 is now moot.

Accordingly, withdrawal of the rejection of claims 1, 3-5, 7-10 and 21 under 35 U.S.C. § 102(b) is respectfully requested.

Rejection Under 35 U.S.C. § 102(b)/103(a)

In Section 8 of the September 18, 2006 Office Action, claim 6 was rejected under 35 U.S.C. § 102(b) as purportedly anticipated by, or alternatively under 35 U.S.C. § 103(a) as allegedly unpatentable over Kubota.

The Examiner stated that Kubota teaches in columns 3-4, a separator comprising monomers represented by Formula (1), Formula

(2) and Formula (3) compounds. The Examiner further stated that Kubota teaches in column 5, lines 60-64, that in conducting polymerization that any one of the compounds of general formula (1), (2) and (3) may be polymerized alone, or two or more of these compounds may be polymerized in combination with one another in an arbitrary proportion. The Examiner also stated that Kubota teaches in column 9, lines 23-25, that 1-mol/l of LiBF₄ was used in a solution of propylene carbonate/dimethoxyethane.

The Examiner alleged that since Kubota teaches using the same non-crosslinked polymer comprising the same monomers for the polymer electrolyte, then inherently the non-crosslinked polymer having a weight-average molecular weight of about 2000-800,000 must also be obtained. The Examiner further alleged that the presently claimed property of a non-crosslinked polymer having a weight-average molecular weight of about 2000-800,000 would have obviously have been present once the Kubota product is provided.

As discussed *supra*, the cited art does not teach or suggest a polymer gel electrolyte composition comprising (1) a crosslinked polymer network matrix and (2) a non-crosslinked polymer included in the crosslinked polymer network matrix, wherein the crosslinked polymer network gel matrix has a three-dimensional crosslinked structure and contains a solution of an electrolyte in a non-aqueous solvent, and the non-crosslinked polymer is obtained by reacting a polyalkylene glycol compound having one terminal hydroxyl group protected, with a precursor polymer containing an ethylene unit and/or propylene unit and an unsaturated carboxylic acid unit, as provided by the subject matter of amended claim 1 from which claim 6 depends.

Therefore, claim 6 of the present application is submitted to be patentable over the cited art as well.

Accordingly, withdrawal of the rejection of claim 6 under 35 U.S.C. § 102(b) or alternatively under 35 U.S.C. § 103(a) is respectfully requested.

Rejection Under 35 U.S.C. § 103(a) of claim 2

In Section 9 of the September 18, 2006 Office Action, claim 2 was rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Kubota.

The Examiner stated that Kubota teaches in columns 3-4, a separator comprising monomers represented by Formula (1), Formula (2) and Formula (3) compounds. The Examiner further stated that Kubota teaches in column 5, lines 60-64, that in conducting polymerization that any one of the compounds of general formula (1), (2) and (3) may be polymerized alone, or two or more of these compounds may be polymerized in combination with one another in an arbitrary proportion. The Examiner also stated that Kubota teaches in column 9, lines 23-25, that 1-mol/l of LiBF₄ was used in a solution of propylene carbonate/dimethoxyethane.

The Examiner acknowledged that Kubota does not teach that the polymer gel electrolyte composition contains 1 part by weight of the non-crosslinked polymer, 0.1-2 parts by weight of the crosslinked polymer matrix and 3 parts by weight or more of the electrolyte solution.

The Examiner alleged that it would have been obvious to one having ordinary skill in the art at the time the invention was made to use 1 part by weight of the non-crosslinked polymer, 0.1-2 parts by weight of the crosslinked polymer matrix and 3 parts by weight or more of the electrolyte solution, and that discovering the optimum or workable ranges involves only routine skill in the art. The Examiner further alleged that it would

have been obvious to one having ordinary skill in the art at the time the invention was made to use 1 part by weight of the non-crosslinked polymer, 0.1-2 parts by weight of the crosslinked polymer matrix and 3 parts by weight or more of the electrolyte solution, and that discovering an optimum value of a result effective variable involves only routine skill in the art.

As discussed *supra*, the cited art does not teach or suggest a polymer gel electrolyte composition comprising (1) a crosslinked polymer network matrix and (2) a non-crosslinked polymer included in the crosslinked polymer network matrix, wherein the crosslinked polymer network gel matrix has a three-dimensional crosslinked structure and contains a solution of an electrolyte in a non-aqueous solvent, and the non-crosslinked polymer is obtained by reacting a polyalkylene glycol compound having one terminal hydroxyl group protected, with a precursor polymer containing an ethylene unit and/or propylene unit and an unsaturated carboxylic acid unit, as provided by the subject matter of amended claim 1 from which claim 2 depends.

Therefore, claim 2 of the present application is submitted to be patentable over the cited art as well.

Accordingly, withdrawal of the rejection of claim 2 under 35 U.S.C. § 103(a) is respectfully requested.

In view of the amendments to the claims and remarks hereinabove, Applicant maintains that claims 1-10 and 21 are now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a telephone interview would be of assistance in advancing prosecution of the subject application, Applicant's undersigned attorneys invite the Examiner to telephone them at the telephone

Kunio Maruyama, et al.
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Filed: April 19, 2004
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number provided below.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition.

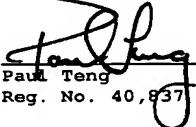
No fee is deemed necessary in connection with the filing of this Amendment. However, if any fees are required, authorization is hereby given to charge the amount of any such fee to Deposit Account No. 03-3125.

Respectfully submitted,



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I hereby certify that this correspondence is being deposited this date with the U.S. Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

 December 18, 2006
Date

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